Fall 2012

The Effect of a Brief Mindfulness Induction on Perceptions of Taste and Caloric Consumption in Emotional Eating in a Laboratory Context

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Undergraduate Thesis

October 25th, 2012

Abstract

This project aims to examine whether a brief mindfulness induction impacts perceptions of food taste and caloric consumption in a stressful situation. The project is a subset of a larger research study, in which the objective is to determine whether brief mindfulness inductions have an effect on emotional eating in a stressful situation. Participants are randomized to listen to a mindfulness induction recording, or an attention control recording, and then complete a timed math test, while having access to snack food. We predicted that participants would more accurately estimate caloric consumption and show an increase in food enjoyment following mindfulness relative to the control recording. We also predict a significant reduction in anxiety levels following the mindfulness relative to control recording. Results indicated no significant difference between the mindfulness and control conditions on enjoyment ratings of foods or the accuracy of estimates of caloric intake. Results, however, did indicate a significant reduction in anxiety immediately after the mindfulness induction, relative to the control recording.

The Effect of Brief Mindfulness Inductions on Perceptions of Taste and Estimated Caloric Consumption in Stress Eating

Modern Western society bustles with challenges, deadlines and distractions that can cause stress responses on a daily basis. With increasing pressure for individuals to excel in all aspects of life, researchers are searching for new and innovative ways of decreasing perceived stress in the population to increase overall quality of life. The American Psychological Association defines stress as a pattern of specific and non-specific responses an organism makes to stimulus events that disturb equilibrium and tax or exceed an organism's ability to cope (VandenBos, 2007). Though stress responses are natural and beneficial in some situations, an excess of these responses can become too taxing for an individual to cope with and lead to negative coping strategies, one of which is emotional eating. Emotional eating is defined as the consumption of food for any reason other than biological hunger, mostly commonly due to stress (Nguyen-Rodriguez, Chou, Unger & Spruijt-Metz, 2008). In the context of this paper, biological hunger refers to a deficiency in nutrition that would cause an individual to seek out food. Emotional eating, though not always brought on by stress, is more broadly induced by negative emotional cues, through which an individual believes the consumption of food will bring about a feeling of relief from a negative stimulus.

To the extent that it is employed as a negative coping strategy, emotional eating may contribute to multiple health problems in this country, such as high cholesterol, diabetes and obesity (Pinaquy, Chabrol, Simon, Louvet, & Barbe, 2003), which makes it essential for researchers to find an effective way to reduce these negative effects of stress on the population, and provide people with the skills to decrease negative coping strategies such as emotional eating. Searching for a way to effectively reduce negative stress responses and increase

cognitive durability to stressful stimuli, researchers have turned increasingly to mindfulness. Mindfulness is defined as the state of being attentive to and aware of what is taking place in the present (Brown & Ryan, 2003), and in the West, has been adapted from Buddhist traditions as a means of introducing the beneficial mental health effects of mindfulness independent of the religious or cultural traditions it originated from (Baer 2003).

Mindfulness training is used within psychotherapies such as Acceptance and Commitment (Haynes, Strosahl & Wilson, 1999, 2012) and Mindfulness-Based Cognitive Therapy (Segal, Williams, & Teasdale. 2002) as a set of skills to help people be more self-aware, bring their attention and awareness to the present instead of future or past events, and to respond skillfully to mental processes that contribute to maladaptive behavior. Mindfulness is not considered a relaxation technique, but rather a form of mental training to reduce cognitive vulnerability to reactive modes of mind that might otherwise heighten stress and emotional distress or that may otherwise perpetuate psychopathology (Bishop et al., 2004). Mindfulness inductions do not attempt to control and repress the feelings of stress and anxiety someone is feeling in a situation, but to help them accept and experience the emotions in a more positive way. Through this, individuals may be able to reduce negative coping strategies, such as emotional eating, by gaining the proper skills to cope with the negative stimuli causing a stress response.

In research settings, specific components of mindfulness-based therapy are being isolated and evaluated in order to determine whether brief mindfulness instructions (inductions) help people to skillfully respond to an immediate stressor. For example, one mindfulness induction study showed that university students who participated in a fifteen minute focused

breathing exercise showed a greater willingness to view negative pictures on them than a control group (Arch & Craske, 2006).

Mindfulness training appears to have particularly strong potential for relieving anxiety and stress. Prior research has supported mindfulness as a means to directly increase perceived quality of life and psychological well-being of anxious participants (Nyklicek & Kuijipers, 2008). Mindfulness has also shown long term effects of helping people cope with anxiety disorders. In a study conducted on twenty-two medical patients with DSM-III defined anxiety disorders, and the majority still experienced beneficial clinical and medical effects at the three year follow-up, with eight out of the eighteen participants requiring no further treatment for anxiety (Miller, Fletcher & Kabat-Zinn, 1995). This study showed that mindfulness training in the context of a generic stress reduction group may thus be able to provide patients who are suffering from anxiety and panic with a set of tools for achieving effective, long term, non-pharmacological self regulation. Other research has shown the increase in quality of life and decrease in perceived stress and depression to be directly related to the acquisition and use of mindfulness skills (Nyklicek & Kuijipers, 2008).

As mindfulness and related therapies have been shown to reduce anxiety and stress, it is reasonable to explore whether mindfulness would also reduce emotional eating. Several studies have suggested that mindfulness may help people experience eating with a new perspective. Brown and Ryan (2003) present an example for the use of mindfulness skills in relation to emotional eating. While eating a meal, a person can be aware of the taste experience of the food in the present moment while also noting how full they are becoming due to the consumption of food. This skill may contribute to a higher awareness of consumption while increasing the enjoyment of consuming food. Emotional eating comes about as a coping mechanism when one

experiences stress or negative emotions. Mindfulness based therapies have been shown to reduce anxiety and stress, perhaps this effect would also reduce the coping mechanism of emotional eating. Studies conducted have supported that mindfulness may help people experience eating with a new perspective. LeBel and Dubé (2001) found that people who were attentive and focused on the present moment found more enjoyment from eating chocolate than those who were unfocused and distracted. Another study conducted revealed that mindfulness may indeed be a useful treatment for the reduction of binge eating (Kristeller & Hallett, 1999). Participants who had binge eating disorder showed decreased scores on the binge eating scale, and decreased depression and anxiety.

The present study examined the effects of a brief mindfulness induction on emotional eating. More specifically, this study was designed to look at the effects of a brief mindfulness induction on emotional eating among young women during an immediately stressful situation with substantive stereotype threat. As Spencer, Steele & Quinn (1999) explain, simply placing women in a situation where a stereotype threat is valid or can be confirmed could bring on a substantial level of stress and anxiety. Therefore, when food is placed in front of a person who has undergone a mindfulness induction, we hypothesized that in response to a self-threatening, stereotype-driven stressor, they will feel less psychological stress and anxiety, and will become more aware of their eating-and eat less in response to the stressor (e.g., display less emotional eating). We predict that a brief mindfulness induction will help people be more aware of caloric consumption, and therefore, better able to estimate the amount of calories they have eaten as compared to the control condition. Specifically, we predict that participants in the mindfulness condition will give more accurate estimates of caloric consumption than either of the other groups, with control condition participants guessing less accurately than participants in the

mindfulness condition. Furthermore, we also predict that participants who are given the brief mindfulness induction will have higher ratings of enjoyment than the control condition on the food rating survey they are administered, due to this elevated sense of awareness during the experiment. This study will contribute to a growing body of research focusing on how to decrease stress and the negative coping mechanisms related to stress in the general population, and hopefully point researchers towards an effective solution to reduce emotional eating and reverse some of the consequences that accompany it.

Methods

Participants

A total of 60 female participants were recruited through the online SONA system for undergraduate research participation at the University of Colorado Boulder. On SONA, the study was described as participation in a challenging cognitive task and a separate food rating task (refer to Appendix A for description). To reduce sex differences in eating behaviors and math anxiety and to enable effective use of female math stereotypes, only female participants ages 18-24 were recruited. The mean age of participants was 20.29 (SD=2.89), with 12.97% of participants being Asian, 2.02% of participants Hispanic, and 85.01% of participants Caucasian. Participants who completed the study during either fall or spring semesters received course credits as compensation (one course credit for every half hour of the study) and participants who completed the study in the summer received ten dollars for their participation. All participants were prescreened through the SONA system prior to joining the experiment using the Brief Fear of Negative Evaluation Scale, with a higher score on the questionnaire corresponding to a higher fear of negative social evaluation. For the summer semester, a score of 35 or higher was required to participate in the study. In the fall and spring semesters, a score of 42 or higher was

required to participate. This difference in score is due to the fact that in the summer, participants had much lower overall anxiety ratings than participants during the fall and spring semesters. Other eligibility criteria include not eating two hours prior to the study and no history of high blood pressure, diabetes, or food allergies. These exclusion criteria were checked beforehand and were rechecked upon participants' arrival to ensure study eligibility.

Research Design

This study was a between subjects experimental design, in which the independent variable was the condition to which participants were randomized, and the dependent variables was the participant ratings on the food tasting sheet and their anxiety ratings on the State-Trait-Anxiety Inventory. The data was analyzed to determine if a relationship exists between the mindfulness and control condition scores on food taste and their anxiety ratings. Each of the variables was measured as a continuous variable. This data was analyzed with a one-way ANOVA between the means of taste in the control condition and the mindfulness condition. The data was also analyzed through a one-way ANOVA between the control condition and the mindfulness condition for anxiety. Finally, a one-way ANOVA was conducted between the absolute difference in estimated calories consumed versus actual calories consumed between the two groups to determine which group provided more accurate estimates of caloric consumption.

Measures

Prescreening using Brief Fear of Negative Evaluation Scale

The Brief Fear of Negative Evaluation scale is an abbreviation of the Fear of Negative Evaluation Scale, and is a 12-question likert measure, which determines how a person feels about negative views and judgments that society has of them. The responses are summed together,

with a higher number indicated a higher fear of negative evaluation. This questionnaire was administered prior to the participant signing up for the study and during the baseline questionnaires to determine whether the participant was appropriately anxious towards negative evaluation to participate in the study. Please refer to Appendix C for a copy of this questionnaire.

Study Specific Demographic Questionnaire

The demographic questionnaire contained questions pertaining to the study eligibility of the participant. The questions included the age of the participant, if they had fasted two hours prior to the study, if they had any food allergies or history of high blood pressure or diabetes, and how hungry they were at the time of the experiment (on a scale of one to five). This questionnaire was administered once the participant had arrived for the study, to make sure they were eligible to participate. Please see Appendix C for a copy of this questionnaire.

Anxiety Ratings via State-Trait Anxiety Inventory

The State-Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a 20-item measure that was used to measure levels of anxiety of the participant immediately prior to completing the survey. The STAI is a Likert scale measure ranging from one to four. The responses are summed together, with a higher score on this questionnaire corresponding to higher anxiety levels. The STAI was administered three times throughout the study: when the participant arrived, immediately after the mindfulness or control recording yet prior to the math test, and after the math test, in order to measure their anxiety level at multiple time points. Please refer to Appendix C for a copy of this questionnaire.

Food-Rating Task Questionnaire

This study-specific questionnaire asked participants to rate how much they enjoyed eating each of the six foods for tasting on a scale of one to seven. Administered directly after the food rating task and post-math STAI, this questionnaire was expected to show higher enjoyment ratings within the mindfulness condition as compared to the control condition. Please refer to Appendix C for a copy of this questionnaire.

Calorie Estimation Questionnaire

The estimated calorie task was a study-specific questionnaire designed to ask the participant to estimate how many calories of each food they thought they had consumed during the course of the study. This study-specific questionnaire was administered after the food rating task and post-math STAI had been given to the participant. It was expected that the mindfulness condition would have more accurate caloric estimations than the control group. Refer to Appendix C for a copy of this questionnaire.

Math Test

The math test consisted of fifteen questions ranging from challenging algebra and trigonometry to challenging word problems, and was the immediately stressful situation in the study. These questions were gathered from practice GRE and SAT tests, and were tested for difficulty among one dozen undergraduates. The introduction to the math test was crucial in creating a situation of stereotype threat and anxiety for the participant. In order to create an environment of stereotype threat and negative evaluation, participants were strictly instructed that this was a test of their math weakness, and they would be provided with feedback regarding these weaknesses upon the completion of the study. The front page of the test was made to look

like a standardized test, with the first inner page advising the participant that the test would be strictly timed and was crucial to the study.

Conditions

Mindfulness

The mindfulness induction condition was comprised of one ten-minute recording by a female instructing them to focus their breathing and pay attention to the present moment. This induction was an attempt to help participants accept and understand the negative emotions that may have been provoked by the description of the time of the math test (the stressor), and to decrease their self reported anxiety levels. Refer to Appendix D for a script of the recording.

Active Control

The active control condition was comprised of one ten-minute recording, which consisted of the same female voice reading from a textbook excerpt on thinking and cognition. This recording was an attempt to control for participants' attention and to appear to help in cognitive preparation for the math test without any focus on negative emotions or anxiety surrounding the immediate stressor (math test). This condition was expected to have no effect on the participant's enjoyment ratings on the food-rating task or their ability to accurately estimate calories consumed (or perform on the math test). Refer to Appendix D for a script of the recording.

Procedure

Prescreening and recruitment

Through the recruiting process over the CU Boulder SONA system, student from the University of Colorado completed the Brief Fear of Negative Evaluation scale (see *Measures*). Students who scored above the predetermined cutoff were eligible to sign up for the experiment (see *Participants*). This prescreening process helped to ensure that participants experienced the math test and related manipulations as stressful. Upon arriving at the room of the study, participants were greeted at the door by a female experimenter dressed in professional attire and a lab coat. The experimenter showed the participant into a room with two chairs, a small table and a discrete mounted wall camera, and asked her to sit and turn off her mobile phone.

Consent and Prescreen Verification

The experimenter then handed the participant a consent form and prescreen ID code form, in order to verify that the participant was willing to participate in the study and that she had completed the prescreen on the SONA website. The experimenter allowed ample time for consent-related questions. The experimenter then explained to the participant that throughout the course of the study, the experimenter would be in the room next door while the participant completed all questionnaires, and would return to the room after each section was complete to provide the participant with further instruction. The experimenter then excused herself from the room, and prompted the participant to speak out loud when she had completed the consent and prescreen forms of if she had any further questions.

The experimenter than left this room and entered an observation room immediately adjacent to the experiment room. In this room, the experimenter was able to view and listen to the participant, weigh food, check the condition the participant was in, and play recordings for the participant via the speaker in the experiment room.

Study Specific Demographic

Once the participant had indicated completion of the consent and pre-screen ID form, the experimenter returned to the room and collected the forms, and gave the participant the demographic questionnaire to recheck study eligibility. This questionnaire was crucial to the study and asked questions pertaining to when the participant last ate, how hungry the participant was at the immediate time of the study, and if the participant had a history of diabetes, high blood pressure, or had food allergies. If participants were ineligibile, they were thanked and excused at this time. Participants who failed to fast for the previous two hours (to ensure at least a mild level of hunger) were rescheduled at a later time. In the observation room, the experimenter began video recording the session and then re-entered the experiment room to begin the session.

Saliva Collection

Once the participant had finished this questionnaire and called the experimenter back to the room, a saliva sample was collected from the participant. This saliva sample was deceptive, and was collected under the stated reasoning that the participant had to refrain from eating two hours prior to the experiment in order to give a saliva sample. That is, the saliva samples were collected to ensure that the participant was sufficiently hungry (after fasting two hours prior to the study) to participate in the experiment.

Baseline Brief Fear of Negative Evaluation Scale and STAI

After the saliva sample had been collected and dated, the experimenter gave the participant a packet of baseline questionnaires, advised the participant to answer with the first response that came to mind, and left the experiment room. The baseline questionnaire consisted

of the twelve-question Brief Fear of Negative Evaluation scale, and the State-Trait Anxiety Inventory, in order to determine the participant's level of anxiety at baseline, prior to the experimental condition being administered. While the participant was completing the baseline questionnaires, in the observation room, the experimenter weighed six foods (Reeses Pieces, M&M's, Lays potato chips, Rold Gold Pretzels, raisins and almonds) into six ramekins on a tray, and placed a glass of water on the tray as well. The Reeses Pieces and M&M's were weighed at 95 grams, while the raisins and almonds were weighed at 65 grams. The pretzels were weighed at 35 grams and the Lays potato chips were filled until 27 grams. These amounts ensured that the foods came to nearly the top of each ramekin.

Food Presentation

Once the participant indicated completion of the baseline questionnaires, the experimenter returned to the room to collect the baseline questionnaires and place the food on the table in front of the participant. When the food is placed in front of the participant, the experimenter stated that since the participant had to fast two hours prior to the study, it was expected that she might be a bit hungry, so instead of waiting until the food rating task, the experimenter was going to offer some food now. This deceptive strategy was used to deter the participant from realizing that the food had been weighed out prior to presentation, and represented the variable under investigation. The experimenter stated that there was plenty more food, and that the participants should feel welcome to eat as much as she would like. The experimenter then excused herself from the room under the pretense that she must prepare for the next part of the study, which would take a few minutes.

Math Test Preparation (Experimenter)

The experimenter then set a timer for three minutes, and readied the math test for the participant. During this time, the participant was left in the experiment room with only the food, to acclimatize her to the prospect of having food available for her to eat. The experimenter then placed the math test in a manila envelope on a clipboard. On top of this envelope, the experimenter placed the pre-math State-Trait Anxiety Inventory, which the participant would complete after the condition recording was played, prior to taking the math test. This State-Trait Anxiety Inventory measured the participant's self-reported anxiety after the condition recording had been administered, immediately prior to the start of the math test.

Pre-Math Test STAI and Math Test Introduction

Once the three minute period had passed, the experimenter returned to the experiment room and placed the math test clipboard on the table next to the food tray in front of the participant, with express instruction that the participant should not touch this clipboard or its contents until instructed. The experimenter then introduced the math test as the participant's next task in the study. This introduction was crucial in creating a situation of stress and stereotype threat for the participant. The experimenter stated that the participant's next task in the study was a standardized math test. This test Would be similar to the math portion of the SAT, and was specifically designed to test the participant's math strengths and weaknesses. The participant would have ten minutes to take the math test, which consisted of fifteen problems. At the end of the study the participant would be provided with feedback that would familiarize them with some of their math weaknesses. Through this introduction, participants were expected to experience a high level of stress towards the math test and the feedback they were going to receive after the study. Once the math test had been placed in front of the participant and the math test introduction had been administered, the experimenter excused herself under the

pretense of preparing for the next part of the study, to look up the condition the participant was in. Until this point, the study was double-blind.

Condition Recording

After the experimenter checked the condition, she returned to the experiment room and explained to the participant that she would now hear a recording that would give her further math test related instruction. Once again, the experimenter advised the participant to refrain from touching the math test clipboard or its contents until given instruction to do so at the end of the audio-recording. The experimenter then left the room, leaving the participant with the food tray and math test on the table in front of her. The experimenter then played the recording for the condition the participant was in (either the control condition or the mindfulness condition). Both recordings were approximately ten minutes long, and had a brief three-minute rest period at the end, prior to prompting the participant to begin filling out the pre-math test State-Trait Anxiety Inventory. Once the recording was finished, the participant filled out the pre-math State-Trait Anxiety Inventory, and then opened the manila envelope and began the math test. In the observation room, the experimenter started a timer for ten minutes when the participant started the math test.

Post-Math Test STAI

After the ten-minutes designated for the timed math test had passed, the experimenter returned to the room, collected the math test, envelope, and pre-math State-Trait Anxiety Inventory, and left the food tray on the table. The experimenter then handed the participant the post-math test State-Trait Anxiety Inventory, to determine how anxious the participant was directly after the high stereotype-threat, stressful math test. The experimenter than returned to

the observation room to wait for the participant to complete the post-math State-Trait-Anxiety Inventory.

Food Weighing and Replenishing

Once the participant had indicated completion of the questionnaire, the experimenter returned to the room, collected the questionnaire and then stated that the food needed to be refreshed prior to the participant's completion of the food rating task. The experimenter then stated that during this time, a short recording would play to help the participant reconnect with the previous audio recording she heard. The food tray was then taken to the observation room for a second weighing to determine how much food the participant had consumed during the first half of the study, and a short recording for condition recollection was played while the experimenter weighed and recorded the food. If the participant had sufficiently diminished any food, the food was replenished and the new weight was recorded. The condition recollection recording stated "Please take this time to recall and reconnect with the previous recording you heard, and try to bring that perspective into the food rating task you will be completing in a few minutes". This was repeated three times in order to give the experimenter time to weigh the food.

Food Rating Task

The experimenter then returned to the room with the refilled food tray and the food rating task sheet. The food tray was once again placed on the table and the participant was handed the food rating task sheet. The experimenter then prompted the participant to eat as much of each food as was necessary for her to give a very accurate rating on the food rating task, and that there was no time restriction for this section of the study. The experimenter then left the room to give

the participant time to taste the food. During this time in the observation room, the experimenter graded the math test.

Estimated Caloric Intake Task

When the participant had indicated completion of the food rating task, the experimenter entered the room, collected the food rating task and the food, gave the participant the final questionnaire packet, and left the room. This questionnaire packet contained the estimated caloric intake sheet, which asked the participant to estimate how many calories of each food she thought she had eaten. This questionnaire packet also contained a questionnaire designed to determine if the participant had listening to the condition and followed the instructions, and also to determine if the participant knew what this study was truly about. While the participant was filling out this questionnaire packet, the experimenter was in the observation room weighing the food for the last time, to determine how much the participant ate during the food rating task. Once the participant had indicated completion of the last questionnaire packet, the experimenter returned to the room to collect the packet, debrief the participant, and grant either course credit or money as compensation.

Results

Baseline, Pre-math test and Post-math test STAI

Please see Figure 1. As predicted, there was no significant difference between the mindfulness $M = 36.07$ (SD = 9.93) and control $M = 35.93$ (SD = 8.41) conditions for the baseline STAI, $F(2,59) = 30.68$, $p = .96$. Also as predicted, there was a significant difference between the mindfulness $M = 32.17$ (SD = 8.93) and control $M = 40.72$ (SD = 12.51) groups on the pre-math STAI, $F(2,58) = 13.74$, $p = .00$. However, there was no significant difference

between the mindfulness M = 41.09 (SD = 10.40) and control M = 39.05 (SD = 11.29) condition groups on the post-math STAI, $F(2,60) = 11.16$, $p = .38.9$. (Fig. 1).

Food Rating Task

Please refer to Figure 2. There was no significant difference between mindfulness and control conditions on food enjoyment ratings $F(2,57) = .855$, $p = .20$, with the control condition M = 28.22 (SD = 5.57) and mindfulness M = 29.91 (SD = 4.45), though the patterns were in the predicted direction.

Estimated Caloric Intake

Please refer to Figure 2. There was no significant difference between the mindfulness and control conditions on the participant estimates of caloric consumption versus the actual consumption of calories, with mindfulness M = 130.33 (SD = 50.34) and control M = 150.21 (SD = 54.37), though the pattern was in the predicted direction.

Discussion

Overall, these findings have supported mindfulness as an effective way to respond to the negative feelings of anxiety caused by an immediate stressor. This is consistent with the Arch & Craske, (2006) findings, which stated that a brief, focused, breathing exercise increases participant's tolerance to negative images. Overall, this study contributes to a growing body of research on mindfulness as a means of decreasing the negative effects of stress on individuals. These findings are important in contributing to the exploration of effective ways to decrease negative coping mechanisms. The reduction in anxiety immediately after the mindfulness induction is the first step in looking towards the solution to many of the negative coping

strategies caused by immediate stressors, such as emotional eating. The reduction of anxiety may also consequently remove potential coping mechanisms that come along with stress. Reductions in anxiety also support the Nyklicek & Kuijipers, 2008 study, that reports an increase in self-reported quality of life in participants. A decrease in anxiety based on mindfulness inductions may help the population reduce overall undesired, negative coping mechanisms.

Anxiety Ratings via State-Trait Anxiety Inventory

Since there was no significant difference between the two groups during the baseline State-Trait Anxiety Inventory, this indicates that the experiment was double blind until the induction was administered. As both groups were significantly different on the pre-math STAI, this supports our hypothesis that the brief mindfulness inductions would have an immediate effect on anxiety, with the mindfulness group having significantly lower means on this measure of anxiety. However, this effect diminished at the post-math STAI measure, after the participants had been administered the stressor. One possible reason for this diminished mindfulness effect could be due to the length of the mindfulness induction. A longer mindfulness induction could lead to lower anxiety levels proceeding the math test. Another possible reason could be the stressful nature of the math test. Perhaps the test was too stressful for a brief ten-minute mindfulness induction to have an lasting impact. This could perhaps be resolved by re-evaluating the immediate stressor of the math test to be less stressful. The Arch & Craske (2006) study used negative images to induce negative feelings after the mindfulness induction, which did not produce the level of stereotype threat that the math test accomplished in the current study. The stereotype threat explored by Spencer, Steele & Quinn (1999), which indicated that women placed in a situation of immediate threat to certain skills, knowledge or intelligence generally believed to be inferior to their in-group responded worse on tests of these

skills, which could pose a potential problem to the mindfulness induction used in this study. Perhaps this stereotype threat was too stress-provoking for the brief mindfulness induction administered to participants.

Enjoyment Ratings

The results indicated that there was no significant difference between the mindfulness and control groups on the enjoyment ratings survey. The total enjoyment ratings for both groups were similar, which supports that a brief, ten-minute mindfulness induction does not significantly alter perception of taste. One possible reason for the insignificant result is that the mindfulness induction did not last past the math test, as supported through the post-math test STAI results. Therefore, during the time of the food rating task, participants had the same anxiety level in the mindfulness and control conditions, indicating no mindfulness induction effect. This could be due to the brevity of the mindfulness induction administered to the participants. Since the findings trended in the predicted direction, however, it is possible that the small sample size limited our statistical power to find significant group differences. A larger sample may have resulted in significant findings, with the mindfulness group indicating greater enjoyment during the food rating task. Such a finding would indicate the positive benefits of a brief mindfulness induction, but perhaps only in contexts that were neutral or at least less stressful than the math test.

Estimated Calories vs. Actual Calories Consumed

There was no significant difference between the mindfulness and active control conditions on the estimated calories consumed and the actual calories consumed. Though this could be due to mindfulness having no effect on perceptions of consumption, it could also be

related to the participant's self reported anxiety levels. On the post-math STAI, there was no significant difference between the mindfulness and active control conditions, which indicated that the effects of the mindfulness induction on self-reported anxiety diminished after the math test had been administered. Since the estimated caloric intake task was administered after the post-math STAI, the mindfulness induction was not being tested during this time. The results were in the predicted direction, a larger sample size may again have produced significant results pertaining to the self-reported caloric intake estimates. These findings, if significant, may have contributed to an effective way to reduce emotional eating within the general population, leading to a possible decrease in many health concerns potentially caused by over-eating, as explored by Pinaquy, Chabrol, Simon, Louvet, & Barbe, 2003. A larger sample size may have supported that mindfulness inductions do indeed increase accuracy of estimated caloric intake, which could help individuals recognize the negative coping mechanism of emotional eating in their daily lives, and reduce the consequences of over-eating.

Limitations and Future Studies

This study has certain limitations that must be taken into account when discussing the findings. One possible concern is that the current study had three different experimenters. Though each was trained formally in the proper way to deliver the protocol, individual differences may result in possible differences in how participants scored on their questionnaires. Thus, in the future, data should be analyzed separately by experimenter as well as condition. Since the current study only includes female participants, in future studies it would be ideal to include male participants as well to asses sex differences. Also in future studies, an analysis of cortisol levels before and after a situation of immediate stress would provide a more physiological measure of actual stress that could supplement the self-report questionnaires used

in the current study. Another concern is that the mindfulness induction did not explicitly have participants the skills to successfully accept and cope with situations of anxiousness, stress, and emotional eating. This was supported through the post-math test STAI results, in which participants in the mindfulness and control conditions had similar, non-significant anxiety levels prior to completing the food rating task and estimated caloric intake tasks. Future studies may wish to consider lengthening the mindfulness induction in order to carry the effects of mindfulness over through and beyond the math test or immediate stressor. Future studies may also benefit from a multi-day training in mindfulness, which would likely produce more robust effects on emotional eating. Relatedly, using mindfulness smartphone applications such as the Buddhify application for the Android and iPhone may promote integration of mindfulness into eating in daily life. This smart-phone application provides participants with immediate, brief mindfulness inductions when they need them.

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Figure 1.

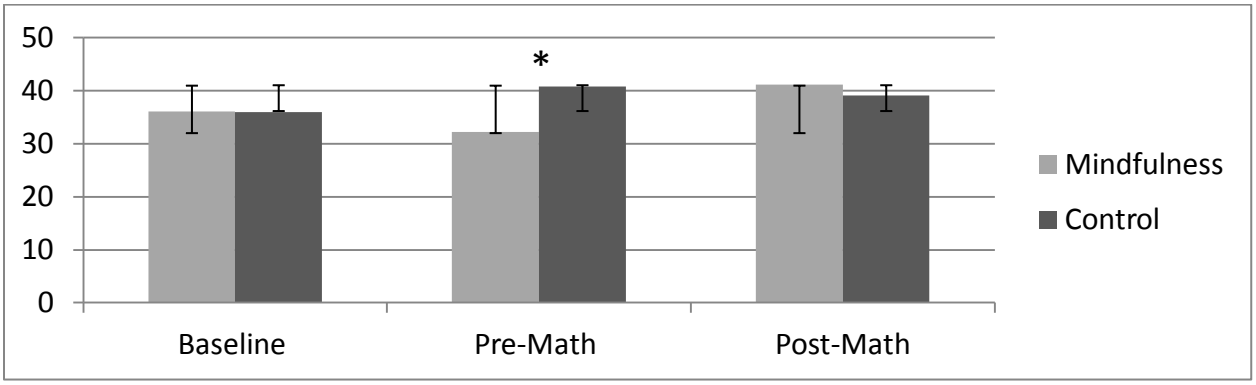

Fig. 1 Baseline, Pre-math test and Post-math test scores for Mindfulness and Control Groups

Figure 2.

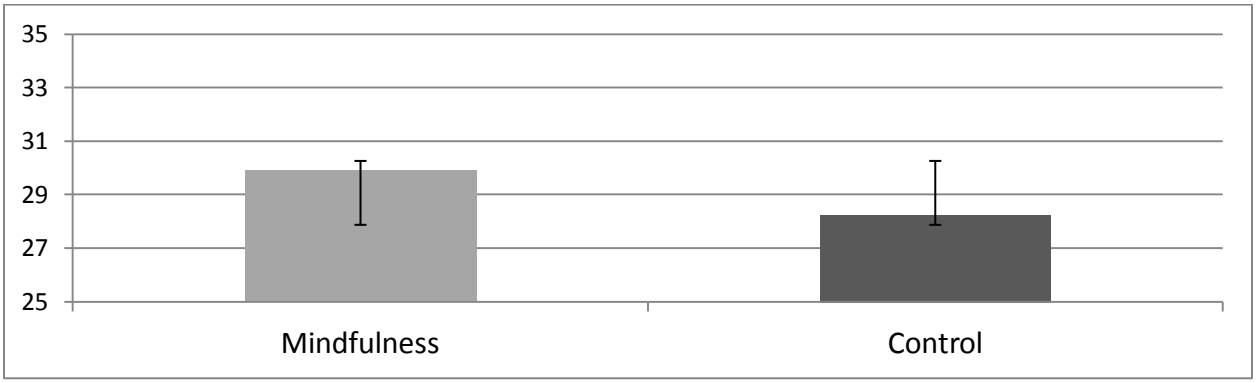

Fig. 2. Mindfulness and control group scores on total enjoyment ratings

Figure 3.

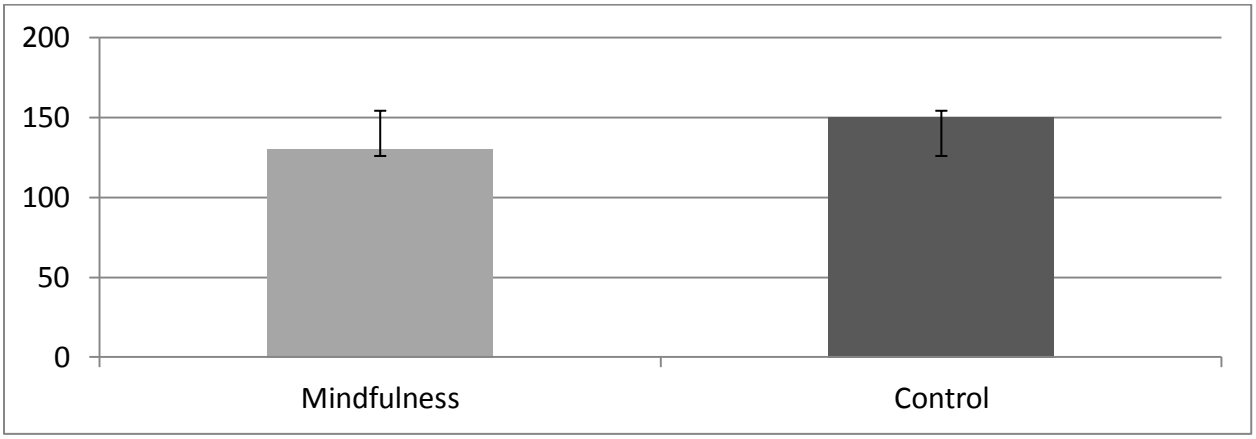

Fig. 3. Mindfulness and Control accuracy on estimated caloric intake.

Appendix A: CU Boulder SONA Description

In this study, you will be performing challenging cognitive tasks, and tasting & rating foods.

ELIGIBILITY REQUIREMENTS: FEMALES ONLY, ages 18-24. Must read and speak English fluently and be a non-smoker. No current illness (head cold, flu, etc). No current or history of food allergies, diabetes, or high blood pressure. You will be asked to provide a saliva sample, so you cannot eat for 2 hours before the study (drinking water or juice is fine).

Appendix B:

Emotional Eating Study Protocol
Arch Lab 2012

***Before Participant Arrives*: Record weights for containers for the first subject at least 15mins BEFORE the subject is scheduled to arrive, or wait until they are completing baseline Q's to prevent the subject from seeing you with ANY food. Prepare subject folders & study materials *prior* to the first subject's scheduled arrival time as follows:**

***Greeting*:** *"Hi, it's good to see you_____[name of participant]. I'm _____, the experimenter for today's session."* Record the participant's arrival time on your coversheet.

***Study reminders*:** Show P where to sit & store their belongings so they're out of the way. *"Please turn off your cell phone if you brought one with you (don't just put it on vibrate). I'll describe today's study briefly before we begin. We're first interested in studying your performance on challenging cognitive activities, and then have a completely separate task for you to complete, where you will taste & rate foods."*

***Consent Process & Prescreen Check**: "Before we begin, please read over the Consent form for the study at your own pace and let me know if you have any questions. After reading each page, please initial it at the bottom, indicating that you have read & understand the content. IF you consent to participating in the study, then sign & date the last page. I'll need you to do this for one copy only; the second is for you to keep. If you consent to participation in this study, I will need you to fill out the next form also. When you're finished, or if you have any questions, just speak aloud & I will hear you through the speaker that's in the corner of this room (indicate direction of speaker), I'll be next door."*

> **FYI:** Allow participants to read the consent form thoroughly, & to ask any questions they may have. If they ask detailed questions about the study at this time, say, "*Sufficient information is available in the consent forms I have given you to read at this time. If you still have questions after reading this form, please don't hesitate to ask me.*" Answer basic study questions briefly. (DO NOT give away the purpose of the study!) You cannot begin the experiment until the Consent form is signed. Study participation is on a volunteer basis, and they can withdraw at any point during the experiment.

After they have signed the consent & prescreen ID form & say they have finished, ask, "*Do you have any [additional] questions about the study?*"

***Screening*:** Once all questions have been addressed, say, "*Next, please fill out this confidential questionnaire. I'll be next door while you complete it. When you're finished, or if you have any questions, just speak aloud & I'll return to the room."* Leave the subject & ready the saliva tube for the next part of the study, labeled with ID#, date, & time. (Ex: 10/27/10-3:45). When the subject says they've finished, review the screener to confirm they are eligible for the study.

> **FYI:** This screening questionnaire confirms the subject's eligibility, and it's essential that you **carefully** check their responses before continuing onto the next

task. **Subjects are INELIGIBLE if they are outside the ages of 18-30, have diabetes/hypoglycemia or high blood pressure, regularly smoke anything, have current illnesses that affects taste (cold, flu, etc), and have current/history of food allergies relevant to the foods in this study (nuts, dairy, soy, etc).** (**Allergy Info**: Dairy=m&m's; Peanuts=reese's pieces & m&m's; Wheat=pretzels; Soy (lecithin)=reese's pieces & m&m's) **Verbally verify their response to allergies (even if left blank, make sure they have NONE!!) If the subject has dietary restrictions & refuses to eat certain foods (gluten, dairy), they are ineligible.**

NOTE!! Your response to their ineligibility will be based on the reason they are unable to participate in the experiment. **We aren't running subjects who have ANY food allergies to any of our snacks**, but the snacks aren't specifically listed in the exclusion criteria online. If they list allergies, have them explain their symptoms- they may just be intolerant & not allergic (ex. Dairy-intolerance to lactose, which usually is fine as long as they avoid only milk and milk-dominant products like yogurt and ice cream rather than all foods containing any dairy whatsoever).

>**If the subject is ineligible for the study, say:** *"Unfortunately, the exclusion criterion/criteria* (name it/them here) *you've indicated on this form prevent(s) us from continuing with the study. [Remind them of advertised exclusion criteria, or explain allergy exclusions here, and say exclusions are due to a food-rating task where they would need to taste the foods they are allergic to.] Thank you for your time."* **They will not receive compensation for this study. (If the subject is over 30 & asked why they are ineligible, say that research had shown there are differences in taste preferences among different age groups, and we have to control for age in our study.)**

>**If the subject is eligible for the study, say:** *"Great! You are eligible to complete today's study."*

***Saliva*:** "*Now I'll have you provide a saliva sample."* Show them the example tube as a visual for how much saliva they should give you (~1ml). "*Here's a tube & straw. I need you to drool into the straw, and fill the tube with this amount of saliva* [again, show the example tube]. *I'll leave to give you privacy, just let me know when you are finished, or if you have any trouble or questions."*

When the subject says they have finished, collect the saliva sample & record the time taken on the tube. It should be properly labeled, & saved ONLY if the subject gave permission on the Consent form to store it for possible future testing; otherwise, discard it immediately following the experiment.

FYI: Saliva is taken MOSTLY to give an explanation to participants re: why they cannot eat for 2 hours prior to the study.

***Baseline Questionnaires*/(Hand the subject the Baseline Packet)** *"Thanks for the saliva sample. This is your next packet to complete which contains some brief questionnaires. Please read the questions carefully and answer with the first response that comes to mind. Please let me know when you are finished."*

Prepare the Subject's Food Tray to take into the room when the subject says they have completed the baseline packet.

***Food Presentation*:** When the subject says they have completed the Q packet, return to the room with the food tray, collect the packet & clipboard, & place the food tray in front of the subject. Say, *"Because you had to fast for a few hours before the study, we imagine that you might be a bit hungry, so instead of having you wait until the food rating task, we have some light foods to offer you now. Just as an allergy precaution, I will point out the food that each bowl contains. I'm going next door to prepare for the next part of the study & will return in a few minutes."* **(Make sure the food tray is within easy reach of the subject, & explain what each ramekin contains.)**

Immediately start a timer & prepare a clipboard with the folder containing the Math Test, the Pre-Math Q Packet above this folder, and a pencil.

***Math Test Anticipation*:** When **EXACTLY 3 MINUTES** have passed, return to the room with the clipboard & math test materials. Say, *"For the next part of the study, your main task will be to take a standardized math test. This test will provide us with a genuine assessment of your quantitative abilities and limitations. The test is not unlike the math portion of the Scholastic Aptitude Test (SAT) and was specifically designed to provide us with a genuine test of your math intelligence. At the end of the study, **you'll be provided with diagnostic feedback** that will familiarize you with some of your **math weaknesses**. You will have 10 minutes to work on the math test, which consists of 15 problems. **It's very important for our purposes that you concentrate and take the test seriously** so that we can accurately diagnosis your math weaknesses. I'm going next door, and will return shortly. Please do not touch the clipboard or its contents until I return, and give you additional instructions."*

Leave the room, and immediately look up which condition they are randomized to.

Audio Recording Preparation: Return to the room and state (based on condition):

> *If they are in the active control or mindfulness conditions: I am now going to play an audiorecording to give you additional math test-related instructions. Please do not touch the clipboard or its contents until given instructions to do so by the audiorecording."*

If the subject is in a recording condition (active control or mindful): Play the appropriate recording for the condition that the subject is in.

CHECK to make sure p has filled out every question for the baseline questionnaires during this time!!!

Audio Recording/Anticipatory Wait: **(Recording is playing here)**

When the subject begins the math test as instructed, set a timer for 10 minutes & re-enter the subject's room at the precise 10-minute mark. If P finishes the test before their time is up, go in & collect the test, & make a note that they finished early & how long it took them to complete it.

***Post-Math Questionnaires I*:** Return to the subject, & say, "*Your time is up; I'll collect the math test from you* [collect the pre-math questionnaire & math test]. *Right now, please complete this*

questionnaire about how you are feeling after taking the math test. Please let me know when you are finished. I'll be next door to give you privacy."

Refresh Food Tray: **When the subject says they are finished, return to collect the Post-MT Q I & ALSO collect the food tray at this time.** Say, *"Thank you. Now, I need to refresh the food tray in preparation for the food rating task."*

> *For Mindfulness and Active control conditions, Say: "During this time, I will play a brief audio-recording to help you reconnect with the listening exercise that you heard during the previous audio recording. I'll return in a few minutes."*

LEAVE THE SUBJECT AND IMMEDIATELY PLAY THE PRE-FOOD TASTING AUDIO-RECORDING FOR THE CONDITION THE SUBJECT IS IN. IF THE SUBJECT IS IN THE INACTIVE CONTROL, PLAY NO RECORDING. Weigh the amount of each food the subject has eaten, recording this information on your coversheet. Refill the bowls as needed, and record new weights for refilled containers.

***Food Ratings*:** Return to the subject with the restocked tray & show them the taste-rating sheet. Say, *"Now we're going to have you rate these foods [point to foods] along these different taste categories. Please eat as much of each food as you need to make an accurate rating for each category. While you're rating the foods, I'm going to grade your math test performance. Please let me know when you're finished. You may take as much time as you need, timing doesn't matter."*

Leave the subject to privately taste and rate the foods. Start grading the test (you will not actually give them feedback, but we still want to know how they did), marking each question as **correct**, **incorrect, skipped**, or **incomplete**. File the Test & the Math Grading Sheet in their subject folder.

***Final Questionnaires*:** When the subject is finished, return with the tray & final questionnaire packet & say, "*Thanks for rating these foods. Here is your final questionnaire packet. After you complete this, we'll meet to discuss your math test performance. Please let me know when you're finished."*

Leave the subject area with the food. They can keep their water if they haven't already finished it.

After they complete the Final Questionnaires, return & collect the final packet. Say: *"Thanks for completing the questionnaires. We're almost done with the study – you have nothing more to complete. We will* ***not*** *be giving you feedback on your math performance today. Once I explain more about the study, it will become clear why we're not doing that."*

***Debriefing*:** Check the participant's psychological state for any undue distress arising from the procedure, and cater your debriefing to their behavior at that time. Make notes on your coversheet detailing your inquiries and their behavior & responses to your inquiries.

Thanks for Time & Participation: "*First, I'd like to thank you for participating in all of the activities we've asked you to do in this study. We realize that it can be a challenging study, and*

really appreciate your effort. Before I discuss the study with you in a little more detail, do you have any questions for me about anything?"

Explain Deception Study: "*What did you think the goals or aims of this study were? [Ask what they think the study hypothesis was, if they have an idea about it]. Before I tell you about the goals of this study, I want to explain why it's necessary in some psychological studies not to tell participants about its purpose or challenges at the very beginning. The reason is that doing so would likely affect the person's behavior, so that how they act or react in the study would no longer reflect how that person naturally reacts in everyday or real-life situations. Discovering how people naturally react is what we're trying to discover here, so we have to wait until after the study (that is, right now) to provide details of our study goals. Can you see why this is important??" [to hold off on revealing the whole purpose of the study at the beginning?]; (because if we did, it might influence your behavior and make the data invalid?)*

Explain Study's Purpose: "*Now, I'd like to explain exactly what we were trying to find out. Remember when I told you we were interested in studying your responses to challenging cognitive performance activities? This was true, but it's important to say that we're* ***also*** *interested in the extent to which people eat in response to performance-related stressors, such as tests. Eating in response to stress is called "emotional eating", and that's what today's study was designed to assess. That's why we had you refrain from eating 3 hours before the study – so that hopefully you would be sufficiently hungry to snack on the food we provided, and felt comfortable eating. Was it obvious to you that this was an eating study?* If so, ask: *"What made you think that is was?" "Do you have any suggestions for how can we make it less obvious?"*

"We took a saliva sample so that you'd not suspect that the study was actually about eating, and will discard your sample unless you give us permission to keep it for potential future testing." [Wait for their response] If the subject agrees that we keep it, say, "*We will store it for up to 2 years, in case we get funding to look at genetics, enzymes, or hormones that may predict a person's response to challenging performance tasks.*

Now getting back to my explanation of the experiment: In order to measure emotional eating, we had to create a stressful situation – in this case, performance on a timed math test. This test was designed to induce a challenging, even stressful experience. Everyone participating in the study receives the same treatment so that we can better understand how different people cope with stress by eating. ***We will not be giving you feedback on your math abilities – we only told you that to make the situation more believable and similar to real-life testing situations.*** *The goal in being graded was not to judge you as a person, or to judge your math abilities, but to introduce a stressful situation and study your eating responses to it. Do you see what I'm saying?*

In more detail, this study is part of a program of research designed to assess the effectiveness of brief mindfulness interventions for stress reduction, and for promoting healthy eating. We aim to find out whether generally adopting a mindfulness approach towards life experiences will dampen tendencies of eating junk food as a reaction to stressful situations (compared to non-mindfulness conditions). You were in the _____ condition. The video recording of this session will help us determine at what point in the study you ate or didn't eat something. After a member of our trained research team watches and makes these ratings, the video will be erased. We're also interested in certain personality traits & how aware people are of their daily experiences,

which are things we assess through the various questionnaires you were given – these help to determine how well people regulate their eating in stressful situations."

Ask Q's: "*Did you find the math test stressful?"* [**Wait for response & take notes of their reply-email their reply to Joanna**]. [If so] *"That is completely normal. Almost everyone finds timed math tests challenging, and often stressful. We realize the study can also make people feel annoyed about having to do this activity. Unfortunately, there is no way to study in detail people's emotional eating responses to demanding performance situations without exposing them to such situations in a laboratory. The **purpose** of this study is to help us design better programs for reducing emotional eating in response to **stresses** that may cause eating disorders in some people, and so we chose to use the math test to induce stress for this purpose alone."*

"How do you feel so far?" [Wait for response]. "*Based on what I've said, do you understand why we asked you to do these activities, and why we believe they're important to the study?"*

(Note to debriefer: **Be sure to spend some time here monitoring the participant's mood state.** If they still seem upset be sure to keep talking to them about their thoughts and feeling

s. Be sure to emphasize that we realize the procedures might have upset them, that we want to understand how they are feeling about their experience, and **to make sure that we have them feeling ok/good about their participation before they leave. Building rapport is very important during this time.)**

Confidentiality: *"I want to again emphasize how important your participation was in this study. Your data is an important contribution to our research goals (of finding out how to best help people respond to stress in healthy ways). The data of other participants will also be very important. I must emphasize that it's **EXTREMELY important** that other people who participate in our experiment enter the same way you did, with absolutely NO knowledge of the tasks they will be asked to complete. If any details of the study were revealed beforehand, it would bias a subject's natural responses to the math test and the amount of food they consume. If that happened, everyone's time spent doing this experiment, including yours today, would be wasted because the data would be useless. This is why we have to ask you **to PROMISE not to tell anyone or share any information about the goals of this study.** This is hard, I realize, especially when we go through a demanding situation since we want to tell others about it! It's easy to think, "what difference does it make if I talk to one of my friends, because there are so many students at CU Boulder and people in the Boulder community, & it's not likely they will be in the study." That may be true, but they might say something to someone else who will be participating, and so on. Are you willing to refrain from talking to ANYONE at CU Boulder or in the larger Boulder community about this study? If you want an easy thing to tell people if they ask you about the experiment, you can say that is was about **people's responses to challenging cognitive tasks**."*

Closing: "*I hope that participating in this study feels worthwhile to you. It makes me feel better to let you in on what we are trying to achieve. We feel that both experimenters and participants are working together to make important discoveries and contributions to people's health and well-being. Do you have any other questions or comments about anything you did today, or anything we've talked about? I want to sincerely thank you again for your participation. I've enjoyed the opportunity to do research with you. Enjoy the rest of your day!*

If the participant's

psychological state still exudes undue distress caused by our experiment, discuss with them the several free counseling services located on the back of the debriefing form, and make sure you recommend they contact Joanna by email to schedule a meeting.

ENDING procedures (DO NOT FORGET!): Provide the subject's take-home debriefing form & attached credits/$10 cash payment (whichever is applicable). IF paying cash, they MUST sign a receipt & initial the Petty Cash Log form confirming that they received the $10 payment.

Appendix C: Questionnaires

Brief Fear of Negative Evaluation Scale

Instructions: Read each of the following statements carefully and indicate how characteristic it is of you according to the following scale:

1	2	3	4	5
Not at all characteristic	Slightly characteristic	Moderately characteristic	Very characteristic	Extremely characteristic

1. I worry about what other people will think of me even when I know it doesn't make a difference 1 2 3 4 5

2. I am unconcerned even if I know people are forming an unfavorable impression of me. 1 2 3 4 5

3. I am frequently afraid of other people noticing my shortcomings. 1 2 3 4 5

4. I rarely worry about what kind of impression I am making on someone. 1 2 3 4 5

5. I am afraid that others will not approve of me. 1 2 3 4 5

6. I am afraid that people will find fault with me. 1 2 3 4 5

7. Other people's opinions of me do not bother me. 1 2 3 4 5

8. When I am talking to someone, I worry about what they may be thinking about me. 1 2 3 4 5

9. I am usually worried about what kind of impression I make. 1 2 3 4 5

10. If I know someone is judging me, it has little effect on me. 1 2 3 4 5

11. Sometimes I think I am too concerned with what other people think of me. 1 2 3 4 5

12. I often worry that I will say or do the wrong things. 1 2 3 4 5

Demographic Questions

Checked: ID # _____ Time/ Date:_____

1. How old are you?_____

2. At **what time** did you **last eat,** and what did you eat at this time?

3. Are you currently on a diet that restricts certain foods? (circle one) Yes No

   If yes, which foods do you not eat?

4. Please list ANY AND ALL allergies (medicines, foods, seasonal, etc.)

5. Please list ANY AND ALL medications used (prescribed/not prescribed)

6. On the list below, please check beside any that you dislike:

   ____ Dairy products

   ____ Eggs

   ____ Peanuts

   ____ Almonds

   ____ Potatoes

   ____ Berries

   ____ Raisins

   ____ Chocolate

   ____ Fish

   ____ Sugar

   ____ Wheat

   ____ Soy

7. Do you have any history of diabetes or high blood pressure? (circle one) Yes No

8. Are you currently ill in such a way that your sense of taste is being affected? (circle one) Yes No

9. Do you smoke cigarettes? (circle one) Yes No

   If yes, how many packs do you smoke in an average week? _____

10. Please indicate how hungry you are *at this moment* (1-5 from list below) _____

1 = very hungry and not at all full

2 = a little hungry and not very full

3 = neither hungry nor full

4 = a little full and not very hungry

5 = completely full and not at all hungry

11. How did you hear about his study? (circle all that apply)

Poster off campus Poster on campus Online Sona Craig's List

Class Friend Other

12. Do you know anyone else who has participated in this study? (circle one) Yes No

If yes, what did you hear about the study?

State-Trait Anxiety Inventory

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to **indicate how you feel right now, that is, AT THIS MOMENT**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer that seems to describe your present feelings the best.

		Not at all	**Somewhat**	**Mostly**	**Completely**
1.	I feel calm.	1	2	3	4
2.	I feel secure	1	2	3	4
3.	I feel tense	1	2	3	4
4.	I feel strained	1	2	3	4
5.	I feel at ease	1	2	3	4
6.	I feel upset	1	2	3	4
7.	I am presently worrying over possible misfortunes	1	2	3	4
8.	I feel satisfied	1	2	3	4
9.	I feel frightened	1	2	3	4
10.	I feel comfortable	1	2	3	4
11.	I feel self-confident	1	2	3	4
12.	I feel nervous	1	2	3	4
13.	I am jittery	1	2	3	4
14.	I feel indecisive	1	2	3	4
15.	I am relaxed	1	2	3	4
16.	I feel content	1	2	3	4
17.	I am worried	1	2	3	4
18.	I feel confused	1	2	3	4
19.	I feel steady	1	2	3	4
20.	I feel pleasant	1	2	3	4

Food Rating Task

Instructions: Please **eat as much of each food as is needed** to make an accurate rating along each dimension. Use the following scale, filling in 1 rating number per box:

0 ----------1 ---------- 2 ---------- 3 ---------- 4 ---------- 5 ---------- 6 ---------- 7

Not at all A little Moderately A lot Extremely

	How much do you **enjoy** eating this food?	How **sweet** does this food taste to you?	How **salty** does this food taste to you?
Reese's Pieces			
M & M's			
Lay's Potato Chips			
Almonds			
Rold Gold Pretzels			
Raisins			

Food Rating Estimates

Please **estimate** how much you ate of each food during the previous food-rating task. If you don't remember, please just try your best. Thank you!!

	How many **calories** of this food did you eat?	How many **pieces** of this food did you eat?
Reese's Pieces		
M & M's		
Lay's Potato Chips		
Almonds		
Rold Gold Pretzels		
Raisins		

Appendix D: Condition Recording Scripts

Excerpt from Mindfulness Recording Script:

Now we're going to have you do a listening exercise for about nine minutes before taking the math test. Some people find this exercise to be helpful in preparing for the math test. I ask that you enter with an open mind, and do your best to follow the instructions as best you can. So first, make sure you put away anything you might be holding, maybe a cell phone or a pen, put those away, out of sight, and settle into a comfortable sitting position. With your back straight but comfortable against the chair, your legs uncrossed, your feet flat on the floor, and your hand resting comfortably in your lap. Now, gently close your eyes, and please follow along with my instructions as best you can. Let's start by just having you check in with what you are experiencing right now, in this moment. Any thoughts or feelings or sensations in your body that might be present. Just notice and observe them, whatever they are, no need to change them. (pause) bringing your attention to noticing the sensations or pressure where your body makes contact with the chair. Just spend a moment or two exploring those sensations of sitting. You're going to be using the stretches of silence to practice on your own (pause). Now gently bring your attention to the sensations of the breath moving in and out of your body, moving in and out of your body you might notice the sensations of breathing in your chest, in your lower abdomen, in your nostrils, just notice where you feel the sensations of breathing the most, strongest. (pause) and to help you pay attention to your breathing, place you hand on your chest or lower belly, or under your nose, wherever the sensations are the strongest for you, and become aware of the changing sensations of breath from moment to moment. Once you've tuned into the physical sensations of breathing, you can remove your hand if you'd like, and continue to focus on the sensations of the breath coming in and going out of the body. Now you might find your thoughts drifting off, thinking about something you did or something you need to do, just notice where your thoughts go. And if your mind wanders off a thousand times, simply bring it back a thousand times, intentionally cultivating an attitude of patience and gentleness towards yourself, as you notice your breath, returning to the breath, breathing in and out, right here, in this present moment. Focus on the actual sensations of the breath entering and leaving the body, just noticing the actual sensations of breathing, there's no need to think about the breath, just experience the sensations of it. And letting your breath be natural, no need to control it. And as best you can, also bring this sense of allowing to the rest of your experience, now and through the rest of today, there's nothing to be fixed, no particular state to be achieved. Simply allow your experience to be your experience, no need to change it in any way. And your mind wanders away from the focus on the breath to thoughts, feelings, daydreams, drifting along, remind yourself that anything that comes into the field of awareness is ok, simply sit with it, and breath, gently escorting your attention to the changing sensations of breathing from moment to moment, using your breath as an anchor to gently reconnect with the here and now each time you notice your mind has wandered, cultivating a sense of gentleness and acceptance for yourself, and for whatever you are experiencing right now, everything is acceptable and you are fine no matter what you may be experiencing, and bringing this sense of allowing into the rest of this study today, into the rest of your day, sense that everything you experience is ok, is acceptable. Bringing this sense of allowing to noticing sitting in the chair again, noticing that you're here in this room. And when you're ready, gently and slowly, open your eyes. You now have another few minutes until the math test begins. (3 minute pause). To give us a sense of how you're feeling right now, we'd now like you to fill out the one-page questionnaire, located on top of the yellow folder and clipboard. Now that you're finished with the questionnaire, it is time to begin the math test. Remember that this test is strictly timed, and is a diagnostic test of your math strengths and weaknesses. So please remove the math test from the yellow envelope in front of you, and place it on the clipboard. You may use the pencil from the questionnaire. Please show all your work on the page and circle the correct answer. Try your best to finish the test, or at least finish as many problems as possible. You have ten minutes. Please begin when you're ready.

Excerpt from Control Recording Script:

Now we're going to have you do a listening exercise for about nine minutes before taking the math test. Some people find this exercise to be helpful in preparing for the math test. In this listening exercise, I will be reading from a book excerpt. Please listen as carefully as possible with your full attention. Throughout history, we humans have

both bemoaned our foolishness and celebrated our wisdom, the poet T.S. Elliot was struck by quote, the hallow men, headpiece filled with straw endquote. But Shakespeare's Hamlet extolled the human species as quote noble in reason, infinite in facilities, in apprehention howled like a god endquote. Thus we both marvel at our abilities and our errors. We study the human brain, three pounds of wet tissue, the size of a cabbage, yet containing circuitry more complex than the planets telephone networks. We marvel at the competence of newborns. We relish our sensory system, which disassembles visual stimuli into millions of nerve impulses, distributes them for parallel processing, and then reassembles them into colorful perceptions. We ponder our memories seemingly limitless capacity, and the ease with which our two track mind processes information, consciously and yet unconsciously. Little wonder that our species has had the collective genius to invent the camera, the car, and the computer, to unlock the atom and crack the genetic code, to travel to outer space, and into the oceans depths, yet we also see that our species is kin to the other animals. We are influenced by the same principles that produced learning in rats and pigeons. As one pundit said echoing Pavlov "howled like a dog". We know that we assimilate reality into our preconceived notions and succumb to perceptual illusions. We see how eagerly we deceive ourselves about pseudo-psychic claims, hypnotic feats and false memories. Next we will encounter images of these two instances of the human condition, the rational and the irrational. We will consider how our cognitive system uses all the information it has received, perceived, stored and retrieved… You now have another few minutes until the math test begins. (3 minute pause). To give us a sense of how you're feeling right now, we'd now like you to fill out the one-page questionnaire, located on top of the yellow folder and clipboard. Now that you're finished with the questionnaire, it is time to begin the math test. Remember that this test is strictly timed, and is a diagnostic test of your math strengths and weaknesses. So please remove the math test from the yellow envelope in front of you, and place it on the clipboard. You may use the pencil from the questionnaire. Please show all your work on the page and circle the correct answer. Try your best to finish the test, or at least finish as many problems as possible. You have ten minutes. Please begin when you're ready.